

Environmental Impact Assessment

July 2017

PAK: Jalalpur Irrigation Project

Project No. 46528-002

Part 2 of 12 of the Appendices

Prepared by Irrigation Department, Government of Punjab for the Asian Development Bank (ADB).

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**Irrigation Department
Government of Punjab**

DETAILED DESIGN OF JALALPUR IRRIGATION PROJECT

Appendices

**ENVIRONMENTAL IMPACT ASSESSMENT
(EIA)**

MAY 2017



Detailed Design of Jalalpur Irrigation Project

APPENDICES

EIA

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Annexure – II

Ambient Air Quality Monitoring Data



Ambient Air Quality

Client : NEC Consultants pvt ltd.
Monitoring Point : Jalal Pur Sharif Village
Monitoring Location : Tehsil Pind Daden Khan
Date of Intervention : August 28-29, 2015

Sr. #	Time	CO (mg/m ³)	NO ₂ (µg/m ³)	NO (µg/m ³)	SO ₂ (µg/m ³)
1	16:00	2.35	4.52	2.75	19.76
2	17:00	2.58	5.32	3.12	18.87
3	18:00	2.63	8.30	2.36	14.42
4	19:00	2.63	4.99	4.09	19.01
5	20:00	2.61	9.59	1.94	23.18
6	21:00	2.56	8.11	1.83	25.73
7	22:00	2.69	6.71	2.72	27.17
8	23:00	2.60	8.17	1.8	24.12
9	00:00	2.47	9.47	1.92	24.54
10	01:00	2.48	7.75	2.28	24.60
11	02:00	2.47	10.29	1.87	24.29
12	03:00	2.48	7.59	2.25	23.68
13	04:00	2.56	8.15	1.88	22.74
14	05:00	2.50	8.07	1.86	22.17
15	06:00	2.52	6.23	3.09	22.30
16	07:00	2.52	8.18	1.81	22.05
17	08:00	2.63	9.99	1.83	17.18
18	09:00	2.52	9.94	2.19	18.92
19	10:00	2.51	8.12	1.88	19.57
20	11:00	2.52	6.64	2.67	18.81
21	12:00	2.57	5.75	3.2	18.00
22	13:00	2.07	8.15	1.88	23.17
23	14:00	2.35	8.07	1.86	24.30
24	15:00	2.35	6.23	3.09	23.18
Average Concentration		2.51	7.68	2.34	21.74

- This report is not valid for any negotiation.
- All transactions are rendered by the Company under the General Conditions of Service accessible at http://www.sgs.com/terms_and_conditions.htm. Attention is drawn to the limitation of liability, Indemnification and Jurisdiction issues defined therein.

For and on behalf of,

SGS PAKISTAN (PVT) LTD

E(QA)

SH



Ambient Air Quality

Client : NEC Consultants pvt ltd.
Monitoring Point : Near Aduwal Village
Monitoring Location : Tehsil Pind Daden Khan
Date of Intervention : August 29-30, 2015

Sr. #	Time	CO (mg/m ³)	NO ₂ (µg/m ³)	NO (µg/m ³)	SO ₂ (µg/m ³)
1	16:00	2.49	10.49	1.36	15.32
2	17:00	2.42	6.28	2.99	9.09
3	18:00	2.47	12.73	3.01	8.29
4	19:00	2.52	7.90	2.24	12.96
5	20:00	2.58	7.58	2.22	15.32
6	21:00	2.59	8.39	1.95	15.96
7	22:00	2.68	9.99	1.87	16.30
8	23:00	2.58	7.74	1.86	15.49
9	00:00	2.59	9.88	1.89	14.24
10	01:00	2.60	7.76	1.89	13.95
11	02:00	2.60	9.85	1.84	13.34
12	03:00	2.67	11.31	1.83	12.51
13	04:00	2.66	9.89	1.85	11.99
14	05:00	2.69	7.75	1.9	11.32
15	06:00	2.65	10.88	1.88	10.69
16	07:00	2.64	5.51	3.57	8.26
17	08:00	2.61	7.87	1.89	5.86
18	09:00	2.51	6.40	2.97	8.16
19	10:00	2.54	9.97	1.94	8.25
20	11:00	2.54	7.79	1.89	7.30
21	12:00	2.59	4.02	3.22	6.65
22	13:00	2.60	6.63	1.8	6.85
23	14:00	2.59	9.07	1.93	8.04
24	15:00	2.59	7.49	1.94	7.26
Average Concentration		2.58	8.47	2.16	10.98

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Ambient Air Quality

Client : NEC Consultants pvt ltd.
Monitoring Point : Village Meiray
Monitoring Location : Tehsil Pind Daden Khan
Date of Intervention : August 30-31, 2015

Sr. #	Time	CO (mg/m ³)	NO ₂ (µg/m ³)	NO (µg/m ³)	SO ₂ (µg/m ³)
1	17:00	2.59	6.89	5.09	20.22
2	18:00	2.35	6.44	4.70	22.92
3	19:00	2.59	8.95	4.97	20.6
4	20:00	2.55	5.36	3.46	21.49
5	21:00	2.61	6.07	2.88	25.55
6	22:00	2.55	7.50	1.91	25.62
7	23:00	2.53	6.99	2.30	27.49
8	00:00	2.54	7.71	1.96	25.99
9	01:00	2.55	7.53	1.95	25.75
10	02:00	2.55	6.23	2.87	25.36
11	03:00	2.58	6.94	2.58	17.07
12	04:00	2.46	5.48	1.87	16.46
13	05:00	2.49	7.53	1.99	15.97
14	06:00	2.42	8.02	3.96	15.09
15	07:00	2.48	9.01	2.96	13.21
16	08:00	2.58	7.89	2.96	13.18
17	09:00	2.61	7.86	3.00	14.17
18	10:00	2.55	5.87	4.00	13.07
19	11:00	2.58	5.13	3.84	12.98
20	12:00	2.54	6.36	2.74	17.84
21	13:00	2.55	7.83	1.88	20.37
22	14:00	2.56	7.50	1.92	20.85
23	15:00	2.55	10.01	1.97	21.16
24	16:00	2.58	8.02	3.96	20.91
Average Concentration		2.54	7.21	2.99	19.72

- This report is not valid for any negotiation.
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For and on behalf of,

SGS PAKISTAN (PVT) LTD

E(QA)

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Ambient Air Quality

Client : NEC Consultants pvt ltd.
Monitoring Point : Kurar Village
Monitoring Location : District Khushab
Date of Intervention : August 31- September 1, 2015

Sr. #	Time	CO (mg/m ³)	NO ₂ (µg/m ³)	NO (µg/m ³)	SO ₂ (µg/m ³)
1	17:00	2.84	6.97	3.98	14.87
2	18:00	2.55	10.01	1.97	14.69
3	19:00	2.52	7.95	2.17	16.78
4	20:00	2.57	8.16	3.77	24.88
5	21:00	2.57	7.38	1.98	32.61
6	22:00	2.55	7.49	1.94	35.89
7	23:00	2.55	7.43	1.87	36.99
8	00:00	2.60	7.26	1.93	35.31
9	01:00	2.56	9.38	1.86	32.75
10	02:00	2.53	7.39	1.99	32.01
11	03:00	2.55	7.81	1.99	31.11
12	04:00	2.52	7.52	1.99	29.99
13	05:00	2.55	7.57	1.95	29.08
14	06:00	2.54	5.58	3.31	27.48
15	07:00	2.59	7.51	2.01	27.56
16	08:00	2.55	7.52	2.02	27.48
17	09:00	2.55	5.63	3.29	27.2
18	10:00	2.57	7.03	2.29	26.65
19	11:00	2.56	7.47	1.9	26.54
20	12:00	2.79	7.48	1.9	24.55
21	13:00	2.74	8.44	2.34	25.66
22	14:00	2.75	8.37	2.42	8.55
23	15:00	2.58	8.16	2.54	7.33
24	16:00	2.48	7.90	3.09	29.99
Average Concentration		2.59	7.64	2.36	26.08

- This report is not valid for any negotiation.
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Ambient Air Quality

Client : NEC Consultants pvt ltd.
Monitoring Point : Jalal Pur Sharif Village
Monitoring Location : Tehsil Pind Daden Khan
Date of Intervention : August 28-29, 2015

Parameter	Unit	Monitoring Duration	LDL	Average Obtained Concentration	NEQS
Nitrogen Dioxide (NO ₂)	µg/m ³	24Hours	1.00	7.68	80 (µg/ m ³) For 24 Hours
Nitrogen Oxide (NO)	µg/m ³	24Hours	1.00	2.34	40 (µg/ m ³) For 24 Hours
Sulphur Dioxide (SO ₂)	µg/m ³	24 Hours	1.00	21.74	120 (µg/ m ³) For 24 Hours
Carbon Monoxide (CO)	mg/m ³	24 Hours	0.01	2.51	05 (mg/m ³) For 08 Hours
Particulate Matter (PM ₁₀)	µg/m ³	24 Hours	2.00	52.21	150 (µg/ m ³) For 24 Hours
Particulate Matter (PM _{2.5})	µg/m ³	24 Hours	-	7.99	35 (µg/ m ³)

µg/m³: microgram per cubic meter

mg/m³: miligram per cubic meter

LDL: Lowest Detection Limit

ppm: parts per million

NEQS: National Environmental Quality Standards

For and on behalf of,

SGS PAKISTAN (PVT) LTD

E(QA)

SH

Ambient Air Quality

Client : NEC Consultants pvt ltd.
Monitoring Point : Near Aduwal Village
Monitoring Location : Tehsil Pind Daden Khan
Date of Intervention : August 29-30, 2015

Parameter	Unit	Monitoring Duration	LDL	Average Obtained Concentration	NEQS
Nitrogen Dioxide (NO ₂)	µg/m ³	24Hours	1.00	8.47	80 (µg/ m ³) For 24 Hours
Nitrogen Oxide (NO)	µg/m ³	24Hours	1.00	2.16	40 (µg/ m ³) For 24 Hours
Sulphur Dioxide (SO ₂)	µg/m ³	24 Hours	1.00	10.98	120 (µg/ m ³) For 24 Hours
Carbon Monoxide (CO)	mg/m ³	24 Hours	0.01	2.58	05 (mg/m ³) For 08 Hours
Particulate Matter (PM ₁₀)	µg/m ³	24 Hours	2.00	58.03	150 (µg/ m ³) For 24 Hours
Particulate Matter (PM _{2.5})	µg/m ³	24 Hours	-	8.70	35 (µg/ m ³)

µg/m³: microgram per cubic meter
 mg/m³: miligram per cubic meter
 LDL: Lowest Detection Limit
 ppm: parts per million
 NEQS: National Environmental Quality Standards

For and on behalf of,

SGS PAKISTAN (PVT) LTD

E(QA)

SH

Ambient Air Quality

Client : NEC Consultants pvt ltd.
Monitoring Point : Village Meiray
Monitoring Location : Tehsil Pind Daden Khan
Date of Intervention : August 30-31, 2015

Parameter	Unit	Monitoring Duration	LDL	Average Obtained Concentration	NEQS
Nitrogen Dioxide (NO ₂)	µg/m ³	24Hours	1.00	7.21	80 (µg/ m ³) For 24 Hours
Nitrogen Oxide (NO)	µg/m ³	24Hours	1.00	2.99	40 (µg/ m ³) For 24 Hours
Sulphur Dioxide (SO ₂)	µg/m ³	24 Hours	1.00	19.72	120 (µg/ m ³) For 24 Hours
Carbon Monoxide (CO)	mg/m ³	24 Hours	0.01	2.54	05 (mg/m ³) For 08 Hours
Particulate Matter (PM ₁₀)	µg/m ³	24 Hours	2.00	39.50	150 (µg/ m ³) For 24 Hours
Particulate Matter (PM _{2.5})	µg/m ³	24 Hours	-	6.18	35 (µg/ m ³)

µg/m³: microgram per cubic meter
 mg/m³: miligram per cubic meter
 LDL: Lowest Detection Limit
 ppm: parts per million
 NEQS: National Environmental Quality Standards

For and on behalf of,

SGS PAKISTAN (PVT) LTD

E(QA)

SH



Ambient Air Quality

Client : NEC Consultants pvt ltd.
Monitoring Point : Kurar Village
Monitoring Location : District Khushab
Date of Intervention : August 31- September 1, 2015

Parameter	Unit	Monitoring Duration	LDL	Average Obtained Concentration	NEQS
Nitrogen Dioxide (NO ₂)	µg/m ³	24Hours	1.00	7.64	80 (µg/ m ³) For 24 Hours
Nitrogen Oxide (NO)	µg/m ³	24Hours	1.00	2.36	40 (µg/ m ³) For 24 Hours
Sulphur Dioxide (SO ₂)	µg/m ³	24 Hours	1.00	26.08	120 (µg/ m ³) For 24 Hours
Carbon Monoxide (CO)	mg/m ³	24 Hours	0.01	2.59	05 (mg/m ³) For 08 Hours
Particulate Matter (PM ₁₀)	µg/m ³	24 Hours	2.00	47.29	150 (µg/ m ³) For 24 Hours
Particulate Matter (PM _{2.5})	µg/m ³	24 Hours	-	8.30	35 (µg/ m ³)

µg/m³: microgram per cubic meter
mg/m³: miligram per cubic meter
LDL: Lowest Detection Limit
ppm: parts per million
NEQS: National Environmental Quality Standards

For and on behalf of,

SGS PAKISTAN (PVT) LTD

E(QA)

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Annexure – III

Standards

National Environmental Quality Standards (NEQS) for Ambient Air

Concentration in Ambient Air				
Pollutants	Time- Weighted Average	Effective from 1 st July 2010	Effective from 1 st January 2013	Method of measurement
SO ₂	Annual Average*	80 µg/m ³	80 µg/m ³	-Ultraviolet Fluorescence Method
	24 hrs**	120 µg/m ³	120 µg/m ³	
NO	Annual Average*	40 µg/m ³	40 µg/m ³	Gas Phase Chemiluminescence
	24 hrs**	40 µg/m ³	40 µg/m ³	
NO ₂	Annual Average*	40 µg/m ³	40 µg/m ³	Gas Phase Chemiluminescence
	24 hrs**	80 µg/m ³	80 µg/m ³	
O ₃	1 hr	180 µg/m ³	130 µg/m ³	Non Dispersive UV Absorption Method
Suspended Particulate Matter (SPM)	Annual Average*	400 µg/m ³	360 µg/m ³	High Volume Sampling (average flow rate not less than 1.1 m ³ /minute)
	24 hrs**	550 µg/m ³	500 µg/m ³	
Respirable Particulate Matter (PM ₁₀)	Annual Average*	200 µg/m ³	120 µg/m ³	-β Ray Absorption Method
	24 hrs**	250 µg/m ³	150 µg/m ³	
Respirable Particulate Matter (PM _{2.5})	Annual Average*	25 µg/m ³	15 µg/m ³	-β Ray Absorption Method
	24 hrs**	40 µg/m ³	35 µg/m ³	
	1 hr	25 µg/m ³	15 µg/m ³	
Lead (Pb)	Annual Average*	1.5 µg/m ³	1 µg/m ³	ASS Method after sampling using EPM 2060 or equivalent Filter paper
	24 hrs**	2 µg/m ³	1.5 µg/m ³	
Carbon Monoxide (CO)	8hrs**	5 mg/m ³	5 mg/m ³	Non Dispersive Infra Red (NDIR) Method
	1 hr	10 mg/m ³	10 mg/m ³	

*Annual arithmetic mean of minimum 104 measurements in a year, taken twice a week 24 hourly at uniform interval.

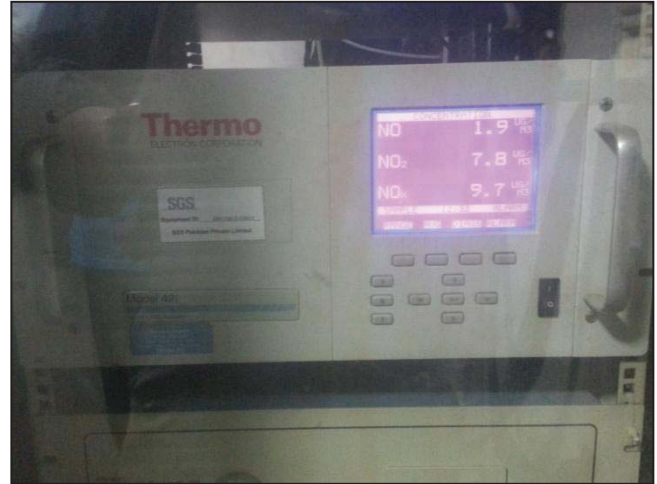
**24 hourly/ 8 hourly values should be met 98% of the in a year. 2% of the time. It may exceed but not on two consecutive days.

Photographic Profile During Sampling

Monitoring of Particulate Matter (PM10 & 2.5) Near Meiri Village



Monitoring of NOx, CO, and SOx Near Aduwal



4.2: Noise Monitoring



Laboratory of Environmental Sciences
(Certified by Punjab EPA)

SOUND LEVEL MONITORING REPORT

A. BASIC INFORMATION

Reference No:	LES/NEC/15/4912	Date of Issue:	September 22, 2015
Customer	NEC Consultants (Private) Limited Perfect Site, 21-km, Off Ferozepur Road, Near Gajju Matta Metro Bus Station, Lahore Ph: 042-35273741-46		
Monitoring date	August 28, 2015		
Monitored by	LES team (M.Zia-ul-haq)		
Monitoring location	Jalalpur Irrigation Project: Jalalpur Sharif		

B. MONITORING RESULTS

#	Location	Date	Time	Sound Level (dBA)
1	Jalalpur Sharif	August 27, 2015	15:00	63.0-76.9
2	Coordinates:		15:20	65.4-78.0
3	E 314496		15:40	66.0-80.3
4	N 3614321		16:00	62.5-77.5
5			16:20	60.3-81.5
6			16:40	61.2-76.4
7			17:00	62.8-82.4
8			17:20	60.9-79.1
9			17:40	63.1-85.3
10			18:00	64.3-82.7
11			18:20	60.4-84.0
12			18:40	61.8-78.5
13			19:00	65.3-79.0
14		August 28, 2015	11:00	60.5-77.6
15			11:20	61.4-79.9
16			11:40	63.6-83.8
17			12:00	60.5-77.3
18			12:20	62.3-78.0
19			12:40	64.6-73.5
20			13:00	62.1-80.3
21			13:20	65.3-79.2
22			13:40	64.8-74.5
23			14:00	65.0-73.7
24			14:20	66.3-89.0
25			14:40	64.4-78.0
26			15:00	65.0-83.0

Note:

1. Sound level was monitored using Sound Meter (SPER SCIENTIFIC 840029);
2. Results relate only to the monitoring duration;
3. Monitoring duration at each source was two minutes.


M. Zia-ul-Haq
Manager (Technical & Quality)


Shafqat Ullah
General Manager

(End of the Report)



Laboratory of Environmental Sciences
(Certified by Punjab EPA)

SOUND LEVEL MONITORING REPORT

A. BASIC INFORMATION

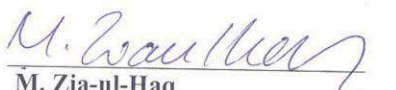
Reference No:	LES/NEC/15/4931	Date of Issue:	September 22, 2015
Customer	NEC Consultants (Private) Limited Perfect Site, 21-km, Off Ferozepur Road, Near Gujju Matta Metro Bus Station, Lahore Ph: 042-35273741-46		
Monitoring date	August 31-September 1, 2015		
Monitored by	LES team (M.Zia-ul-haq)		
Monitoring location	Jalalpur Irrigation Project: Kurar		

B. MONITORING RESULTS

#	Location	Date	Time	Sound Level (dBA)
1	Kurar	August 31, 2015	16:00	55.4-64.0
2	Coordinates:		16:20	56.8-66.2
3	E 264860		16:40	55.0-63.6
4	N 35955618		17:00	58.1-69.7
5			17:20	59.3-70.4
6			17:40	57.5-71.0
7			18:00	53.9-63.8
8			18:20	52.5-60.1
9			18:40	53.8-62.4
10			19:00	59.0-65.8
11		September 1, 2015	11:20	58.7-66.3
12			11:40	58.6-68.5
13			12:00	56.8-70.6
14			12:20	53.4-66.5
15			12:40	57.3-66.5
16			13:00	58.8-69.5
17			13:20	57.7-68.4
18			13:40	58.8-70.5
19			14:00	56.0-65.0
20			14:20	55.5-67.8
21			14:40	54.8-68.1
22			15:00	56.4-69.3
23			15:20	57.0-71.9
24			15:40	55.3-72.0
25			16:00	56.4-68.0
26			16:20	55.8-69.8

Note:

1. Sound level was monitored using Sound Meter (SPER SCIENTIFIC 840029);
2. Results relate only to the monitoring duration;
3. Monitoring duration at each source was two minutes.


M. Zia-ul-Haq
Manager (Technical & Quality)

(End of the Report)


Shafqat Ullah
General Manager



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SOUND LEVEL MONITORING REPORT

A. BASIC INFORMATION

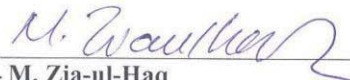
Reference No:	LES/NEC/15/4922	Date of Issue:	September 22, 2015
Customer	NEC Consultants (Private) Limited Perfect Site, 21-km, Off Ferozepur Road, Near Gajju Matta Matro Bus Station, Lahore Ph: 042-35273741-46		
Monitoring date	August 30-31, 2015		
Monitored by	LES team (M.Zia-ul-haq)		
Monitoring location	Jalalpur Irrigation Project: Mire		

B. MONITORING RESULTS

#	Location	Date	Time	Sound Level (dBA)
1	Mire	August 30, 2015	15:00	53.4-60.5
2	Coordinates:		15:20	52.0-59.2
3	E 290572		15:40	51.5-60.3
4	N 3595268		16:00	52.4-62.6
5			16:20	54.6-65.3
6			16:40	49.8-60.5
7			17:00	50.3-61.3
8			17:20	48.9-64.2
9			17:40	48.0-60.3
10			18:00	51.4-61.5
11			18:20	52.6-64.9
12			18:40	54.4-66.7
13			19:00	53.0-64.6
14		August 31, 2015	11:00	52.4-59.0
15			11:20	54.8-66.9
16			11:40	54.9-63.4
17			12:00	50.1-64.0
18			12:20	53.5-61.4
19			12:40	54.4-65.8
20			13:00	50.7-67.2
21			13:20	49.3-61.4
22			13:40	50.8-62.9
23			14:00	52.3-64.0
24			14:20	51.8-62.8
25			14:40	54.8-62.0
26			15:00	53.7-63.5

Note:

1. Sound level was monitored using Sound Meter (SPER SCIENTIFIC 840029);
2. Results relate only to the monitoring duration;
3. Monitoring duration at each source was two minutes.


M. Zia-ul-Haq
Manager (Technical & Quality)

(End of the Report)


Shafqat Ullah
General Manager



Laboratory of Environmental Sciences
(Certified by Punjab EPA)

SOUND LEVEL MONITORING REPORT

A. BASIC INFORMATION

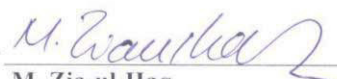
Reference No:	LES/NEC/15/4913	Date of Issue:	September 22, 2015
Customer	NEC Consultants (Private) Limited Perfect Site, 21-km, Off Ferozepur Road, Near Gajju Matta Metro Bus Station, Lahore Ph: 042-35273741-46		
Monitoring date	August 29-30, 2015		
Monitored by	LES team (M.Zia-ul-haq)		
Monitoring location	Jalalpur Irrigation Project: Adowal		

B. MONITORING RESULTS

#	Location	Date	Time	Sound Level (dBA)
1	Adowal	August 29, 2015	15:00	65.1-73.2
2	Coordinates:		15:20	64.1-74.1
3	E 329503		15:40	63.4-80.5
4	N 3610698		16:00	62.5-77.6
5			16:20	61.7-81.4
6			16:40	64.7-82.5
7			17:00	63.6-83.3
8			17:20	64.5-84.6
9			17:40	65.3-84.5
10			18:00	61.2-83.7
11			18:20	62.1-82.3
12			18:40	63.3-81.4
13			19:00	60.1-88.6
14		August 30, 2015	9:00	62.5-79.5
15			9:20	63.4-78.3
16			9:40	64.3-76.1
17			10:00	65.2-75.5
18			10:20	62.3-69.6
19			10:40	61.0-77.8
20			11:00	60.6-78.3
21			11:20	61.3-79.2
22			11:40	62.2-82.3
23			12:00	63.2-84.5
24			12:20	60.1-83.5
25			12:40	63.0-84.0
26			13:00	62.3-82.1

Note:

1. Sound level was monitored using Sound Meter (SPER SCIENTIFIC 840029);
2. Results relate only to the monitoring duration;
3. Monitoring duration at each source was two minutes.


M. Zia-ul-Haq
Manager (Technical & Quality)


Shafqat Ullah
General Manager

(End of the Report)

Noise Monitoring Near Jalalpur Sharif



Noise Monitoring Near Aduwal



4.3: Surface Water and Ground Water



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TEST REPORT

A. BASIC INFORMATION

Reference No:	LES/NEC/15/4930		Date of Issue	September 22, 2015
Customer	NEC Consultants (Private) Limited Perfect Site, 21-km, Off Ferozepur Road, Near Gajju Matta Matro Bus Station, Lahore Ph: 042-35273741-46			
Sample dates	Date of sampling:		September 1, 2015	
	Date of sample received:		September 1, 2015	
Sampling carried out by	LES team (Abdul Ghaffar)			
Sampling location	Jalalpur Irrigation Project: Near Kurar			
Sample description	Type of sample	Surface water (Canal –Minor I)		
	Coordinates	E 267141		
		N 3594133		

B. TEST RESULTS

#	Test Method	Testing Date	Parameter	Unit	Test Results
A. Physico-Chemical Testing					
1	APHA 4500-H-B	2/9/2015	pH	-	7.84 ± 0.08
2	APHA 5210-B	7/9/2015	Biochemical Oxygen Demand (BOD ₅)	mg/L	5 ± 1
3	APHA 5220-D	2/9/2015	Chemical Oxygen Demand (COD)	mg/L	29 ± 2
4	Turbidity Meter	9/9/2015	Turbidity	NTU	453 ± 16
5	APHA 2540-D	8/9/2015	Total Suspended Solids (TSS)	mg/L	560 ± 7
6	APHA-2540-D	9/9/2015	Total dissolved solid (TDS)	mg/L	410 ± 6
7	Atomic Absorption	10/9/2015	Aluminum*	mg/L	<0.02
8	Atomic Absorption	10/9/2015	Zinc*	mg/L	<1.0
9	Atomic Absorption	10/9/2015	Antimony*	mg/L	<0.005
10	Atomic Absorption	10/9/2015	Cadmium*	mg/L	<0.002
11	Atomic Absorption	10/9/2015	Mercury*	mg/L	<0.001
12	Atomic Absorption	10/9/2015	Nickel*	mg/L	<0.02
13	Atomic Absorption	10/9/2015	Selenium*	mg/L	<0.005
14	Atomic Absorption	10/9/2015	Barium*	mg/L	0.148
15	Atomic Absorption	10/9/2015	Boron*	mg/L	0.096
16	APHA 3500-Mg-E	10/9/2015	Manganese*	mg/L	<0.5
17	APHA 3500-Cr-B	14/9/2015	Total Chromium	mg/L	0.03 ± 0.01
18	HACH-8506	14/9/2015	Copper	mg/L	0.21 ± 0.03
19	APHA 3500-Pb-B	14/9/2015	Lead	mg/L	0.008 ± 0.002
20	Arsenic kit	10/9/2015	Arsenic	mg/L	BDL
B. Bacteriological Testing					
1	APHA 9221-B	5/9/2015	Total Coliform	MPN/100mL	> 1.6x10 ⁴
2	APHA 9221-E	5/9/2015	Fecal Coliform	MPN/100mL	> 1.6x10 ⁴

* Test conducted at Sub-Contract lab SGS Lahore, report reference # 713042

- No Unit

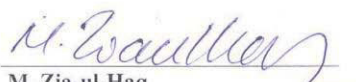
NTU

Nephelometric Turbidity Unit

APHA American Public Health Association

BDL Below detection limit

Note: Results relates only to the sample tested.


M. Zia-ul-Haq
Manager (Technical & Quality)


Shafqat Ullah
General Manager

(End of the Report)

Page 1 of 1



A. BASIC INFORMATION

B. TEST RESULTS

* Test conducted at Sub-Contract lab SGS Lahore, report reference # 713042

No Unit

NTU

Nephelometric Turbidity Unit

APHA American Public Health Association

BDL Below detection limit

Note: Results relates only to the sample tested.


M. Zia-ul-Haq
Manager (Technical & Quality)



Shafqat Ullah
General Manager

(End of the Report)

Page 1 of 1



Laboratory of Environmental Sciences
(Certified by Punjab EPA)

TEST REPORT

A. BASIC INFORMATION

Reference No:	LES/NEC/15/4926		Date of Issue	September 22, 2015
Customer	NEC Consultants (Private) Limited Perfect Site, 21-km, Off Ferozepur Road, Near Gajju Matta Matro Bus Station, Lahore Ph: 042-35273741-46			
Sample dates	Date of sampling: Date of sample received:		August 31, 2015 September 1, 2015	
Sampling carried out by	LES team (Abdul Ghaffar)			
Sampling location	Jalalpur Irrigation Project: Golpur near Bhelowal			
Sample description	Type of sample	Surface water Rain water drain		
	Coordinates	E 305409		
		N 3607725		

B. TEST RESULTS

#	Test Method	Testing Date	Parameter	Unit	Test Results
A. Physico-Chemical Testing					
1	APHA 4500-H ⁻ -B	31/8/2015	pH	-	8.17 ± 0.08
2	APHA 5210-B	7/9/2015	Biochemical Oxygen Demand (BOD ₅)	mg/L	31 ± 2
3	APHA 5220-D	2/9/2015	Chemical Oxygen Demand (COD)	mg/L	216 ± 8
4	Turbidity Meter	9/9/2015	Turbidity	NTU	102 ± 4
5	APHA 2540-D	8/9/2015	Total Suspended Solids (TSS)	mg/L	100 ± 4
6	APHA-2540-D	9/9/2015	Total dissolved solid (TDS)	mg/L	290 ± 5
7	Atomic Absorption	10/9/2015	Aluminum*	mg/L	<0.02
8	Atomic Absorption	10/9/2015	Zinc*	mg/L	<1.0
9	Atomic Absorption	10/9/2015	Antimony*	mg/L	<0.005
10	Atomic Absorption	10/9/2015	Cadmium*	mg/L	<0.002
11	Atomic Absorption	10/9/2015	Mercury*	mg/L	<0.001
12	Atomic Absorption	10/9/2015	Nickel*	mg/L	<0.02
13	Atomic Absorption	10/9/2015	Selenium*	mg/L	<0.005
14	Atomic Absorption	10/9/2015	Barium*	mg/L	0.037
15	Atomic Absorption	10/9/2015	Boron*	mg/L	0.280
16	APHA 3500-Mg-E	10/9/2015	Manganese*	mg/L	0.5
17	APHA 3500-Cr-B	14/9/2015	Total Chromium	mg/L	0.02 ± 0.01
18	HACH-8506	14/9/2015	Copper	mg/L	0.09 ± 0.02
19	APHA 3500-Pb-B	14/9/2015	Lead	mg/L	0.005 ± 0.001
20	Arsenic kit	10/9/2015	Arsenic	mg/L	BDL
B. Bacteriological Testing					
1	APHA 9221-B	5/9/2015	Total Coliform	MPN/100mL	> 1.6x10 ³
2	APHA 9221-E	5/9/2015	Fecal Coliform	MPN/100mL	> 1.6x10 ³

* Test conducted at Sub-Contract lab SGS Lahore, report reference # 713042

- No Unit NTU Nephelometric Turbidity Unit

APHA American Public Health Association

BDL Below detection limit

Note: Results relates only to the sample tested,

M. Zia-ul-Haq
Manager (Technical & Quality)

Shafqat Ullah
General Manager

(End of the Report)

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Laboratory of Environmental Sciences
(Certified by Punjab EPA)

TEST REPORT

A. BASIC INFORMATION

Reference No:	LES/NEC/15/4921		Date of Issue	September 22, 2015
Customer	NEC Consultants (Private) Limited Perfect Site, 21-km, Off Ferozepur Road, Near Gajju Matta Metro Bus Station, Lahore Ph: 042-35273741-46			
Sample dates	Date of sampling: Date of sample received:		August 30, 2015 August 31, 2015	
Sampling carried out by	LES team (Abdul Ghaffar)			
Sampling location	Jalalpur Irrigation Project: Sauwal			
Sample description	Type of sample	Surface water (Rain water drain)		
	Coordinates	E 325820 N 3617130		

B. TEST RESULTS

#	Test Method	Testing Date	Parameter	Unit	Test Results
A. Physico-Chemical Testing					
1	APHA 4500-H ⁺ -B	31/8/2015	pH	-	7.96 ± 0.08
2	APHA 5210-B	5/9/2015	Biochemical Oxygen Demand (BOD ₅)	mg/L	16 ± 2
3	APHA 5220-D	31/8/2015	Chemical Oxygen Demand (COD)	mg/L	134 ± 6
4	Turbidity Meter	9/9/2015	Turbidity	NTU	70.4 ± 1.5
5	APHA 2540-D	8/9/2015	Total Suspended Solids (TSS)	mg/L	70 ± 2
6	APHA-2540-D	9/9/2015	Total dissolved solid (TDS)	mg/L	1080 ± 12
7	Atomic Absorption	10/9/2015	Aluminum*	mg/L	<0.02
8	Atomic Absorption	10/9/2015	Zinc*	mg/L	
9	Atomic Absorption	10/9/2015	Antimony*	mg/L	<0.005
10	Atomic Absorption	10/9/2015	Cadmium*	mg/L	<0.002
11	Atomic Absorption	10/9/2015	Mercury*	mg/L	<1.0
12	Atomic Absorption	10/9/2015	Nickel*	mg/L	<0.02
13	Atomic Absorption	10/9/2015	Selenium*	mg/L	<0.005
14	Atomic Absorption	10/9/2015	Barium*	mg/L	0.239
15	Atomic Absorption	10/9/2015	Boron*	mg/L	0.154
16	APHA 3500-Mg-E	10/9/2015	Manganese*	mg/L	<0.5
17	APHA 3500-Cr-B	14/9/2015	Total Chromium	mg/L	0.02 ± 0.01
18	HACH-8506	14/9/2015	Copper	mg/L	0.11 ± 0.02
19	APHA 3500-Pb-B	14/9/2015	Lead	mg/L	0.004 ± 0.001
20	Arsenic kit	10/9/2015	Arsenic	mg/L	BDL
B. Bacteriological Testing					
1	APHA 9221-B	3/9/2015	Total Coliform	MPN/100mL	> 1.6x 10 ⁴
2	APHA 9221-E	3/9/2015	Fecal Coliform	MPN/100mL	> 1.6x 10 ⁴

* Test conducted at Sub-Contract lab SGS Lahore, report reference # 713042

- No Unit -

NTU

Nephelometric Turbidity Unit

APHA American Public Health Association

BDL Below detection limit

Note: Results relates only to the sample tested.

M. Zia-ul-Haq
Manager (Technical & Quality)

Shafqat Ullah
General Manager

(End of the Report)

Page 1 of 1



Laboratory of Environmental Sciences

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TEST REPORT

A. BASIC INFORMATION

Reference No:	LES/NEC/15/4915		Date of Issue	September 22, 2015
Customer	NEC Consultants (Private) Limited Perfect Site, 21-km, Off Ferozepur Road, Near Gajju Matta Matro Bus Station, Lahore Ph: 042-35273741-46			
Sample dates	Date of sampling:		August 30, 2015	
	Date of sample received:		August 31, 2015	
Sampling carried out by	LES team (Abdul Ghaffar)			
Sampling location	Jalalpur Irrigation Project: Jalapur Sharif			
Sample description	Type of sample	Surface water- River water (Jhelum) downstream		
	Coordinates	E 350869 N 3614235		

B. TEST RESULTS

#	Test Method	Testing Date	Parameter	Unit	Test Results
A. Physico-Chemical Testing					
1	APHA 4500-H ⁻ -B	31/8/2015	pH	-	8.18 ± 0.08
2	APHA 5210-B	5/9/2015	Biochemical Oxygen Demand (BOD ₅)	mg/L	7 ± 1
3	APHA 5220-D	3/9/2015	Chemical Oxygen Demand (COD)	mg/L	120 ± 5
4	Turbidity Meter	9/9/2015	Turbidity	NTU	19.3 ± 0.6
5	APHA 2540-D	8/9/2015	Total Suspended Solids (TSS)	mg/L	150 ± 5
6	APHA-2540-D	9/9/2015	Total dissolved solid (TDS)	mg/L	230 ± 6
7	Atomic Absorption	9/9/2015	Aluminum*	mg/L	<0.02
8	Atomic Absorption	9/9/2015	Zinc*	mg/L	<1.0
9	Atomic Absorption	9/9/2015	Antimony*	mg/L	<0.005
10	Atomic Absorption	9/9/2015	Cadmium*	mg/L	<0.002
11	Atomic Absorption	9/9/2015	Mercury*	mg/L	<0.001
12	Atomic Absorption	9/9/2015	Nickel*	mg/L	<0.02
13	Atomic Absorption	9/9/2015	Selenium*	mg/L	<0.005
14	Atomic Absorption	9/9/2015	Barium*	mg/L	0.176
15	Atomic Absorption	9/9/2015	Boron*	mg/L	0.073
16	APHA 3500-Mg-E	9/9/2015	Manganese*	mg/L	<0.5
17	APHA 3500-Cr-B	14/9/2015	Chromium	mg/L	0.02 ± 0.01
18	HACH-8506	14/9/2015	Copper	mg/L	0.06 ± 0.1
19	APHA 3500-Pb-B	14/9/2015	Lead	mg/L	0.006 ± 0.001
20	Arsenic kit	10/9/2015	Arsenic	mg/L	BDL
B. Bacteriological Testing					
1	APHA 9221-B	4/9/2015	Total Coliform	MPN/100mL	> 1.6x10 ⁷
2	APHA 9221-E	3/9/2015	Fecal Coliform	MPN/100mL	> 1.6x10 ⁷

* Test conducted at Sub-Contract lab SGS Lahore, report reference # 713042

- No Unit

NTU

Nephelometric Turbidity Unit

APHA American Public Health Association

BDL Below detection limit

Note: Results relates only to the sample tested.

M. Zia-ul-Haq
Manager (Technical & Quality)

Shafqat Ullah
General Manager

(End of the Report)

Page 1 of 1



Laboratory of Environmental Sciences

(Certified by Punjab EPA)

TEST REPORT

A. BASIC INFORMATION

Reference No:	LES/NEC/15/4914		Date of Issue	September 22, 2015
Customer	NEC Consultants (Private) Limited Perfect Site, 21-km, Off Ferozepur Road, Near Gajju Matta Metro Bus Station, Lahore Ph: 042-35273741-46			
Sample dates	Date of sampling:		August 30, 2015	
	Date of sample received:		August 31, 2015	
Sampling carried out by	LES team (Abdul Ghaflar)			
Sampling location	Jalalpur Irrigation Project: Head Rasool			
Sample description	Type of sample	Surface water -River water (Jhelum) Upstream		
	Coordinates	E 360725		
		N 3617831		

B. TEST RESULTS

#	Test Method	Testing Date	Parameter	Unit	Test Results
A. Physico-Chemical Testing					
1	APHA 4500-H-B	31/8/2015	pH	-	7.38 ± 0.08
2	APHA 5210-B	5/9/2015	Biochemical Oxygen Demand (BOD ₅)	mg/L	8 ± 1
3	APHA 5220-D	31/8/2015	Chemical Oxygen Demand (COD)	mg/L	95 ± 3
4	Turbidity Meter	9/9/2015	Turbidity	NTU	10.0 ± 0.4
5	APHA 2540-D	9/9/2015	Total Suspended Solids (TSS)	mg/L	10 ± 2
6	APHA-2540-C	10/9/2015	Total dissolved solid (TDS)	mg/L	250 ± 6
7	Atomic Absorption	10/9/2015	Aluminum*	mg/L	<0.02
8	Atomic Absorption	10/9/2015	Zinc*	mg/L	<1.0
9	Atomic Absorption	10/9/2015	Antimony*	mg/L	<0.005
10	Atomic Absorption	10/9/2015	Cadmium*	mg/L	<0.002
11	ICP	10/9/2015	Mercury*	mg/L	<0.001
12	Atomic Absorption	10/9/2015	Nickel*	mg/L	<0.02
13	Atomic Absorption	10/9/2015	Selenium*	mg/L	<0.005
14	Atomic Absorption	10/9/2015	Barium*	mg/L	0.105
15	Atomic Absorption	10/9/2015	Boron*	mg/L	0.012
16	APHA 3500-Mg-E	10/9/2015	Manganese*	mg/L	<0.5
17	APHA 3500-Cr-B	14/9/2015	Chromium	mg/L	0.03 ± 0.01
18	HACH-8506	14/9/2015	Copper	mg/L	0.05 ± 0.1
19	APHA 3500-Pb-B	14/9/2015	Lead	mg/L	0.005 ± 0.001
20	Arsenic kit	10/9/2015	Arsenic	mg/L	BDL
B. Bacteriological Testing					
1	APHA 9221-B	4/9/2015	Total Coliform	MPN/100mL	> 1.6x10 ³
2	APHA 9221-E	3/9/2015	Fecal Coliform	MPN/100mL	> 1.6x10 ³

* Test conducted at Sub-Contracted lab SGS Lahore, report reference # 713042

- No Unit

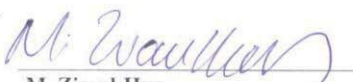
NTU

Nephelometric Turbidity Unit

APHA American Public Health Association

BDL Below detection limit

Note: Results relates only to the sample tested,



M. Zia-ul-Haq
Manager (Technical & Quality)



Shafqat Ullah
General Manager

(End of the Report)



Laboratory of Environmental Sciences

(Certified by Punjab EPA)

TEST REPORT

A. BASIC INFORMATION

Reference No:	LES/NEC/15/4929		Date of Issue	September 22, 2015
Customer	NEC Consultants (Private) Limited Perfect Site, 21-km, Off Ferozepur Road, Near Gajju Matta Metro Bus Station, Lahore Ph: 042-35273741-46			
Sample dates	Date of sampling:		September 1, 2015	
	Date of sample received:		September 1, 2015	
Sampling carried out by	LES team (Abdul Ghaffar)			
Sampling location	Jalalpur Irrigation Project: Kurur			
Sample description	Type of sample	Groundwater Category-2 (Agri-Tube well)		
	Coordinate	E 264902 N 3595645		

B. TEST RESULTS

#	Test Method	Testing Date	Parameter	Unit	Test Results	National Standard
A. Physico-Chemical Testing						
1	Meter	7/9/2015	Conductivity	µs/cm	3410 ± 7	NGV
2	APHA 2540-D	2/9/2015	Total Suspended Solids (TSS)	mg/L	3 ± 1	NGV
3	APHA-2540-D	2/9/2015	Total dissolved solid (TDS)	mg/L	1370 ± 9	<1000
4	APHA 4500-Cl-B	7/9/2015	Chloride (Cl ⁻)	mg/L	560 ± 6	250
5	HACH-8051	10/9/2015	Sulfate	mg/L	90 ± 4	400
6	APHA 2320-B	7/9/2015	Bicarbonate	mg/L	224 ± 6	NGV
7	HACH-8039	7/9/2015	Nitrate (NO ₃ ⁻ -N)	mg/L	0.4 ± 0.1	50
8	APHA 3500-Mg-E	7/9/2015	Magnesium (Mg)	mg/L	20 ± 1	100
9	APHA 3500-Ca-B	7/9/2015	Calcium as (Ca)	mg/L	25 ± 1	200
10	APHA 4500 P	16/9/2015	Phosphate*	mg/L	<0.05	NGV
11	AAS/ICP	16/9/2015	Sodium*	mg/L	622.5	200
12	AAS/ICP	16/9/2015	Potassium*	mg/L	3.6	NGV
13	AAS/ICP	16/9/2015	Ammonia*	mg/L	<0.1	NGV
14	AAS/ICP	16/9/2015	Boron*	mg/L	0.075	0.3
15	AAS/ICP	16/9/2015	SAR*	-	19.62	NGV
B. Bacteriological Testing						
1	APHA 9221-E	3/9/2015	E.Coli	MPN/100mL	>23	Nil

* Test conducted at Sub-Contract lab SGS Lahore, report reference Env-Lhr 679/2015-08

-	No Unit	NTU	Nephelometric Turbidity Unit
APHA	American Public Health Association	NGV	No Guideline Value
BDL	Below detection limit		

Note: Results relates only to the sample tested,

M. Zia-ul-Haq
Manager (Technical & Quality)

Shafqat Ullah
General Manager

(End of the Report)